

LISTING OF CLAIMS

This Listing of Claims replaces all prior versions and listings of claims in this application.

Claims 1-28 (canceled)

29. (New) A tunable microwave arrangement, comprising:

a microwave circuit device,

a substrate, and

a layered ground plane structure disposed between the microwave circuit device and the substrate, wherein the layered ground plane structure comprises at least one patterned first metal layer, at least one second metal layer, and at least one tunable ferroelectric film layer between the at least one patterned first metal layer and the at least one second metal layer.

30. (New) The tunable microwave arrangement of claim 29, wherein the at least one patterned first metal layer comprises a patterned electromagnetic band gap crystal structure.

31. (New) The tunable microwave arrangement of claim 29, wherein the at least one tunable ferroelectric film layer is patterned.

32. (New) The tunable microwave arrangement of claim 29, wherein the at least one ferroelectric film layer is not patterned.

33. (New) The tunable microwave arrangement of claim 29, wherein the at least one second metal layer is not patterned.

34. (New) The tunable microwave arrangement of claim 29, wherein the at least one second metal layer is patterned.

35. (New) The tunable microwave arrangement of claim 29, wherein the at least one second metal layer comprises platinum, copper, silver, or gold.

36. (New) The tunable microwave arrangement of claim 29, wherein the at least one tunable ferroelectric film layer comprises strontium titanate (SrTiO_3) or barium strontium titanate ($\text{Ba}_x\text{Sr}_{1-x}\text{TiO}_3$).

37. (New) The arrangement of claim 29, wherein the layered ground plane structure is tunable in response to a DC voltage applied between the at least one patterned first metal layer and the at least one second metal layer.

38. (New) The arrangement of claim 37, wherein tuning the layered ground plane structure tunes the microwave circuit device without decoupling circuits on the microwave circuit device.

39. (New) The arrangement of claim 37, wherein the applied DC voltage affects a dielectric constant of the at least one patterned first metal layer, thereby changing an impedance of a surface of the layered ground plane structure adjacent the microwave circuit device.

40. (New) The arrangement of claim 29, wherein the microwave circuit device comprises at least one microstrip line.

41. (New) The arrangement of claim 29, wherein the microwave circuit device comprises a patch resonator.

42. (New) The arrangement of claim 29, wherein the microwave circuit device comprises an inductor coil.

43. (New) The arrangement of claim 29, wherein the microwave circuit device comprises a microwave transmission line.

44. (New) The arrangement of claim 29, wherein the microwave circuit device comprises a coplanar strip line device.

45. (New) The arrangement of claim 29, wherein the substrate comprises a semiconductor, a dielectric, or a metal.

46. (New) The arrangement of claim 29, wherein a dielectric having low permittivity and low loss is disposed between the microwave circuit device and a top patterned first metal layer of the layered ground plane structure.

47. (New) The arrangement of claim 46, wherein the dielectric comprises a benzocyclobutene (BCB) or other polymer.

48. (New) The arrangement of claim 37, wherein the applied DC voltage is less than about 100 volts.

49. (New) The arrangement of claim 48, wherein the applied DC voltage is less than about 10 volts.

50. (New) The arrangement of claim 29, wherein the at least one tunable ferroelectric film layer has a thickness of about 1-2 micrometers.

51. (New) The arrangement of claim 29, wherein the microwave circuit device comprises a semiconductor integrated circuit.

52. (New) The arrangement of claim 29, wherein the layered ground plane structure comprises a multilayer structure having more than one ferroelectric film layer, each ferroelectric film layer being disposed between respective first and second metal layers.

53. (New) A method of tuning a microwave arrangement comprising a microwave circuit device, a substrate, and a layered ground plane structure disposed between the microwave circuit device and the substrate, the method comprising the step of applying a DC tuning voltage between a first patterned metal layer and a second metal layer disposed on opposite sides of a ferroelectric layer, wherein the layered ground plane structure comprises the layers.

54. (New) The method of claim 53, wherein the first patterned metal layer comprises a patterned electromagnetic band gap crystal structure.

55. (New) The method of claim 53, wherein applying the DC tuning voltage changes an impedance on a top of the layered ground plane structure, thereby changing a resonant frequency of the microwave circuit device.

56. (New) The method of claim 53, further comprising the step of, in a multilayered ground plane structure comprising more than two ferroelectric film layers, selecting any of the first and second metal layers surrounding any of the ferroelectric films for tuning the microwave/integrated circuit device.